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Student Medicine

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Student Medicine

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Editorial Comment

GRANTS FOR RESEARCH IN STUDENT MEDICINE

THE following announcement from the Committee on Research of the American College Health Association, made at the time of the 1956 annual meeting of the association, is of such interest and importance that it should be brought to the attention of everyone interested in student health work.

The Committee on Research is pleased to inform members of the American College Health Association that the Continental Casualty Company has established grants in support of promising research in student medicine.

The purpose of the Continental Casualty Research Grants is to encourage investigation which will promote the physical and mental health of college students and benefit student medical practices. Grants will be limited to research projects related to these objectives.

Two grants of $500 will be made annually. One grant will be awarded to support research in a college of less than 2,000 enrollment. One grant will be awarded to a college of more than 2,000 enrollment.

Grants can be used for either clinical or experimental research. The funds can be used as the sole source of support for exploratory or small-scale studies. The funds can be used in conjunction with college or other funds to support sections of a large-scale research project.

Grant recipients will be selected annually by the Committee on Research of the American College Health Association. Member colleges are invited to submit research proposals (6 copies) at any time. Recipients will be announced at the annual meeting of the Association based on all proposals received by February 1st. of that year. Recipients will be selected according to the merits of the research design and the apparent value of the project to the field of student medicine.

Proposals can be mailed to John Summerskill, PhD, Chairman, Committee on Research, Student Medical Clinic, Cornell University, Ithaca, New York.

The period of agreement between the Continental Casualty Com-

pany and the American College Health Association for these grants is for three years beginning May 15, 1956. By convention, professional and public reports on grant research should credit the Continental Casualty Company for financial support.

In this scientific era when research assumes such importance in every field, and especially in medicine, student medicine has not kept pace. Relatively little research is being reported from campus clinics and infirmaries. Two research grants will not go far to improve the situation, but it is an important step in the right direction. Perhaps other companies will follow the lead of the Continental Casualty Company and provide more funds for research. Even more important should be the stimulus to student health workers, for in planning and submitting research proposals their interest in their projected study may be so stirred that they will find means for carrying it to completion even though their original request for funds may not have been granted.

It is easy to find excuses for not doing research, such as lack of time, lack of adequate facilities, lack of material, and so on. Since much of present-day research is big business with complicated equipment, large staffs, and big budgets, it is understandable that the student health physician excuses his failure to do research. But such reasoning is not valid. Research, especially clinical research, can be successfully carried on wherever there are patients, even healthy ones, and a physician with an inquiring mind. Many studies are possible with no more elaborate facilities than are found in the office of any physician.

The value of research is measured not only by the findings, which may or may not be of importance, but also by the effect on the physician and his patients. The researcher tends to develop habits of more careful observation and more complete study of his subjects which can only result in improved medical care, not only of research subjects but of all patients.

The Committee on Research of the American College Health Association and the Continental Casualty Company deserve commendation for their encouragement of research in student medicine.

EDITORIAL COMMENT

PRIVILEGED COMMUNICATIONS AND HEALTH FORMS

In the following pages Dr. John Hathaway of Yale University considers a problem which arises with increasing frequency to vex student health physicians. Health questionnaires of various sorts are being employed in increasing numbers by many agencies and institutions. Some forms require answers to relatively few questions, which are, however, "loaded" so that they infringe on the confidential doctor-patient relationship; others are forms demanding long medical histories and physical examinations. What physician does not inwardly cringe when he sees a student enter his office carrying one, or often several, of these forms?

Dr. Hathaway points out that many of these forms place the physician in the position of serving two masters simultaneously and also invade the privacy of patient-doctor communications. The physician can serve neither party to full advantage and is made uneasy by his unsatisfactory role. More important is the fact that medical care for the student may be impaired because, knowing that his health record is not confidential, the student may not seek medical treatment or may seek it off campus. This is especially likely to happen in the case of emotional or mental disturbance. Since students with such difficulties are often reluctant to seek help, anything which increases their reluctance is to be avoided if at all possible. We agree with Dr. Hathaway that many health forms are undesirable.

This does not mean that we fail to recognize that the selecting agencies also have a problem. In these days of increasing numbers of applicants for educational opportunities, all institutions must strive harder than ever to select students who will be able to profit from and complete their education. For every student who starts but fails or drops out for whatever reasons, there is another person, perhaps more capable, who has been denied the opportunity of continuing his education. The large percentage of students who enter but fail to graduate from our colleges and

universities attests to the desirability of improved methods of selection.

We believe that methods of selection must and can be found which do not infringe on the privileged character of the doctor-patient relationship and which do not jeopardize continuing good medical care. Perhaps the answer can be found in some form of psychological and health index to be filled by the applicant, especially if supplemented by personal interview. The high cost of present-day education justifies a considerable effort to solve the problem.

Psychological Depression and Educational Attitudes

MORRIS ROSENBERG, PH.D., CORNELL UNIVERSITY

ONE of the difficulties involved in studying the student's adjustment to university life lies in the fact that the term "adjustment" may be used to encompass a large number of attitudes and actions.[1] To say that a student is "adjusted" may mean that he is enjoying college life; it may refer to the fact that he is academically successful; it may indicate that he is integrated in the social life of the campus community; it may suggest a positive attitude toward the system of higher education; it may mean that he is satisfied with, and uncritical of, a number of aspects of college life—the way classes are conducted, the type of knowledge to which he is exposed, the ability of his professors, the nature of the college administration, the types of sports activities, and so on. Probably no single one of these attitudes would serve as an adequate criterion of adjustment, but probably most of them would be considered in evaluating a student's degree of adjustment.

It is obvious that emotional factors will almost invariably play some role in determining the student's adjustment to college life. The purpose of the present report is to present a body of data showing the relationship between the student's degree of adjustment, as reflected in his attitudes toward various aspects of college life, and his expression of feelings of psychological depression.

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[1] The present report is part of a broader study of students' values conducted under the supervision of the following members of the Department of Sociology and Anthropology, Cornell University: Edward A. Suchman, Robin M. Williams, Jr., Rose K. Goldsen, and Morris Rosenberg.

METHOD

In 1952 a sample of 1,571 students at Cornell filled out a questionnaire dealing with a wide range of attitudes and values. One of the areas covered in detail was educational values. This study of students' thought patterns was supplemented by an attempt to uncover certain psychological characteristics of the respondents.

Limitations of time prevented us from subjecting the students to a battery of psychological tests, but we did include one simple index of psychological depression: "How would you say you feel most of the time—in good spirits or in low spirits?" Our data revealed that the responses to this question (which in itself had nothing to do with education) were significantly related to a wide range of educational attitudes.

RESULTS

In order to simplify the presentation of the data, we have first set forth the results in the form of a series of propositions, and then adduced the evidence upon which each conclusion is based.

The depressed student is more likely than others to be dissatisfied with the system of higher education. What is the student's appraisal of the American college system? In order to study this question, we developed a scale of "general satisfaction with college," [2] consisting of the following five items:

1. I am disillusioned about college life.
2. On the whole, colleges are doing a good job.
3. Most of what I am learning in college is very worth while.
4. I don't have as much respect for college education as I did before I came here.
5. America has the best system of college education in the world.

Table 1 indicates that the most depressed students were three-and-a-half times as likely as the most cheerful students to be relatively dissatisfied with the American system of college education (48 per cent to 14 per cent). These results suggest that atti-

[2] This scale proved to be reliable according to the Guttman criteria; the reproducibility was 91 per cent. For a discussion of the logic of the Guttman method, see Louis Guttman, in S. A. Stouffer *et al.*, *Measurement and Prediction* (Princeton: Princeton University Press, 1950), chs. 3 and 6.

tudes toward the educational system are closely linked to the individual's emotional state. Table 1 shows the students' answers to the question, "How would you say you feel most of the time —in good spirits or in low spirits?"

Table 1. Good spirits and "general satisfaction with college" scale.

"Satisfaction with college" scale	*Very good spirits*	*Fairly good spirits*	*Neither good nor bad spirits*	*Fairly low or very low spirits*
High	65%	55%	32%	26%
Medium	20	24	31	26
Low	14	21	36	48
N = 100%	(369)	(950)	(163)	(66)

The depressed student is less likely than others to be enjoying college life. From the coldly functional point of view, it does not matter particularly whether the student enjoys college life or finds it disagreeable. The avowed purpose of the university is to impart knowledge, and if it turns out a well-educated man, it may consider its job well done.

There are few, however, who would adopt such an icy point of view. The college administrators and faculty know that college is an emotional experience to students, and it is simply normal human sympathy for them to want it to be a positive emotional experience. For college represents four long years of living, marking the transition from adolescence to manhood. If a student obtains little or no enjoyment during this long and important period of his life, it is in itself a tragedy of no mean proportions.

In order to examine this question, we asked our respondents, "What kind of a time are you having at college?" The results indicate a very positive feeling among students. On the nationwide level, 31 per cent said they were having a "very good time," 40 per cent said a "fairly good time," and 23 per cent said "OK," whereas only 5 per cent said they were having a "fairly poor time" and 1 per cent a "very poor time." [3] At Cornell, the level of enjoyment was slightly higher. But Table 2 shows that the depressed student is far less likely to be sharing in this general

[3] These data are based upon the responses of 2,975 students at eleven universities.

Table 2. Good spirits and enjoyment of college life.

Time in college	*Very good spirits*	*Fairly good spirits*	*Neither good nor bad spirits*	*Fairly low or very low spirits*
Very good time	75%	41%	12%	5%
Fairly good time	20	44	43	20
"OK" or poor time	5	14	44	75
N = 100%	(368)	(949)	(163)	(64)

enjoyment than the cheerful student. In fact, those in good spirits were fifteen times as likely as those in low spirits to be having a "very good time" in college (75 per cent to 5 per cent). The reason, of course, is obvious, but this result illustrates rather strikingly the way in which psychological factors are linked to the gratifications the student is able to derive from college life.

The depressed student is less likely than others to be integrated in the social life of the community. Social activities form an important part of life on the campus. Students go out on dates, join fraternities, participate in clubs and other campus organizations, go drinking with their friends. Let us consider two kinds of social activities—participation in extracurricular activities and membership in a fraternity. We find that only 47 per cent of the most depressed students participated in more than one extracurricular activity, compared with 75 per cent of the most cheerful students, and that 68 per cent of the latter group belonged to a fraternity, compared with 29 per cent of the former group. These data suggest that emotional factors are also intimately bound up with patterns of interpersonal interaction on the college campus.

The depressed student is more likely than others to feel that what he is learning is futile, useless, and dull. If the depressed student is poorly adjusted at the social level, he fares no better in classroom matters. Not in terms of academic performance—his grades, on the average, are no worse than those of any other groups—but in terms of his attitudes. In a variety of ways, he manifests a critical attitude toward various aspects of learning. The depressed student is less likely than others to feel that what he is learning in college is worth while. He is also three times as likely as the cheerful student to say that "a lot" of the time he spends in

class or on assignments involves doing things that are unimportant. Finally, he is five times as likely as the student who is generally in very good spirits to say that he "often" thinks that what he is doing in college is a waste of time. In fact, if we combine these three items into a "worth-whileness of education" scale, we find that 73 per cent of the depressed respondents ranked low on such a scale, compared with 39 per cent of the cheerful students (Table 3).

Table 3. Good spirits and "worth-whileness of education" scale.

Worth-whileness of education scale	*Very good spirits*	*Fairly good spirits*	*Neither good nor bad spirits*	*Fairly low or very low spirits*
Low	39%	47%	58%	73%
Medium	38	33	28	18
High	24	20	13	9
N = 100%	(369)	(950)	(163)	(66)

Nor are the depressed students particularly impressed by the practical value of college education. They were two-and-a-half times as likely as the cheerful ones to agree that "college does not really equip you for life outside the campus" (Table 4).

Table 4. Good spirits and practical relevance of education.

"I think college does not really equip you for life outside the campus"	*Very good spirits*	*Fairly good spirits*	*Neither good nor bad spirits*	*Fairly low or very low spirits*
Agree	17%	19%	24%	44%
Undecided	11	16	26	11
Disagree	70	64	48	45
N = 100%	(369)	(950)	(163)	(66)

In a variety of ways, then, the depressed student tends to express a sense of futility about the strictly educational aspects of college life.

The depressed student is more likely than others to be poorly adjusted at the classroom level. Given the fact that the depressed student is relatively likely to feel that much of what he is learning is worth-

less, it is not surprising to find that he tends more than others to cut classes. Table 5 indicates that three times as many depressed as cheerful students cut classes "more often" than most students they knew.

Table 5. Good spirits and classroom attitudes and behavior.

"Do you think you cut classes more or less often than most students you know?"	*Very good spirits*	*Fairly good spirits*	*Neither good nor bad spirits*	*Fairly low or very low spirits*
More often	10%	13%	16%	30%
About as often	29	30	29	32
Less often	61	57	54	38
N = 100%	(369)	(950)	(163)	(66)

The depressed students were not only more likely to be critical of the university, but they were also more likely to be displeased with their study habits. This was illustrated in an interesting way when we asked students whether they were satisfied with the amount of time they spent studying. Those who were generally in good spirits were two-and-a-half times as likely as those in poor spirits to be satisfied. Conversely, the depressed students were more likely to feel that they studied too little, *but they were also more likely to feel that they studied too much* (Table 6). If the student is depressed, he is evidently more likely to be dissatisfied with his own study habits.

Table 6. Good spirits and satisfaction with time devoted to study.

"Are you, yourself, satisfied with the amount of time you spend studying?"	*Very good spirits*	*Fairly good spirits*	*Neither good nor bad spirits*	*Fairly low or very low spirits*
No, don't study enough	58%	59%	54%	69%
No, study too much	2	6	12	15
Yes, I am satisfied	40	35	34	15
N = 100%	(369)	(950)	(163)	(66)

The depressed student is less likely to feel that his college is doing a good job in satisfying certain educational values. One of the original aims of the present study was to reveal and analyze students'

educational values. Our first step, then, was to conduct a number of intensive interviews with students to find out what factors they considered important in a college education. The requirements of a satisfactory college education mentioned most frequently were the following: it should provide vocational training and equip the student for his career; it should teach the student how to get along with other people; it should provide him with a basic general education and appreciation of ideas; it should stimulate his interest in community and world problems; it should develop his moral capacities and values; it should prepare him for marriage and family life. In our sample survey we asked our respondents which of these values they considered important and "to what extent do you think Cornell is doing the sort of job with respect to each of these educational goals that you, personally, would like to see it do." Table 7 shows that, with regard

Table 7. Good spirits and belief that colleges are satisfactorily fulfilling educational values.

"To what extent do you think Cornell is doing the sort of job with respect to each of these educational goals that you, personally, would like to see it do."	*Very good spirits*	*Fairly good spirits*	*Neither good nor bad spirits*	*Fairly low or very low spirits*
	Per cent highly satisfied			
Provide vocational training	57%	58%	52%	44%
Get along with people	58	45	35	23
Basic general education	52	45	40	38
Interest world problems	20	15	18	15
Moral capacities and values	14	10	8	9
Marriage and family	15	9	7	6
N = 100%	(369)	(950)	(163)	(66)

to *every one* of these six values, the depressed students were less likely than the cheerful ones to feel that Cornell was doing a satisfactory job. In addition, the depressed students were twice as likely as those in good spirits to maintain that "college education does more to break down values than to build up ideals" (Table 8). The relationship between emotional factors and the evaluation of college performance seems clear.

Table 8. Good spirits and belief that colleges break down values.

"College education does more to break down values than to build up ideals."	*Very good spirits*	*Fairly good spirits*	*Neither good nor bad spirits*	*Fairly low or very low spirits*
Agree	11%	14%	19%	24%
Undecided	14	19	29	23
Disagree	74	65	50	51
N = 100%	(369)	(950)	(163)	(66)

The depressed student is more likely than others to agree with various charges which have been launched against the American system of higher education. American colleges often find themselves under attack from various quarters. At various times, colleges have been deemed culpable of an almost endless series of sins, many of them contradictory. We constructed a list of some of these attacks and asked our respondents to tell us whether they felt these charges were justified. The depressed student, on a variety of issues, is more likely to agree with these criticisms. He is relatively likely to agree with charges of "production-line" teaching methods, charges of suppression of academic freedom, charges of discrimination in college admissions policies, charges that colleges do not keep up with the times (Table 9). In other words, the depressed student is more likely than others to be critical of academic policy.

Table 9. Good spirits and agreement with charges against colleges.

Charges against colleges	*Very good spirits*	*Fairly good spirits*	*Neither good nor bad spirits*	*Fairly low or very low spirits*
	Per cent who think charges are justified			
"Production-line" teaching methods	63%	64%	72%	83%
Suppression of academic freedom	22	29	34	48
Racial and religious discrimination in admissions policies	46	46	51	70
Colleges don't keep up with the times	11	9	10	21
N = 100%	(369)	(950)	(163)	(66)

DISCUSSION

The foregoing material has been essentially descriptive rather than analytical in nature. We have seen that there are striking and general differences between the psychologically depressed and cheerful students with regard to college attitudes and behavior. Of course, we cannot be certain in every case of the causal relationships involved. Certainly one possible reason for these phenomena is that the individual's psychological problems are displaced onto the university system. If this were the case, the student would be less able to spot the good things about college life and would be more alert to see its deficiencies. In addition, it is usually more comforting to feel, if one is depressed, that things are bad "out there" rather than that the difficulty lies within oneself. On the other hand, it is possible that actual disagreeable experiences with college life have produced the feeling of depression in the individual. Without further data it is impossible to determine which factor is primary. If we assume, however, that one of the indexes of psychological health is the ability to tolerate the frustrations of actual experience, then we would be disposed to conclude that the psychological difficulties are more likely to be responsible for the negative attitudes and behavior than the other way around. This conclusion, however, should not be interpreted as denying the possibility that both factors may be mutually reinforcing. An individual's psychological disturbance may prevent him from becoming integrated in the college community and enjoying the other benefits and satisfactions of college life; this, in turn, may enhance his state of depression, thus completing a cycle in a spiraling process. We would expect that this phenomenon accounts for most of the relationship between psychological depression and educational attitudes.

The reader who is disturbed at these findings may ask, "What can we do about it?" Psychotherapeutic aid no doubt would be of value; special efforts to integrate the depressed student into the college community probably would also help. But such solutions are likely to be costly and time-consuming, outstripping the resources of most universities. In any case, it would probably be

futile to try to change the educational system in order to meet the depressed person's criticisms. For many of these people, the problem lies within themselves, not within the educational system.

If our answer to the question of "what to do" is a discouraging one, the reader may nevertheless take comfort in the observation that the number of people who are very depressed, in terms of our index, is very small. The vast majority of students claim to be in good spirits most of the time. The small group of students who characterize themselves as psychologically depressed, however, appear to be relatively poorly adjusted to college life.

[EDITOR'S NOTE: Dr. Rosenberg's paper raises, but does not provide a satisfactory answer to, the question "What can we do about the psychologically depressed student in our colleges and universities?" Believing that workable solutions can be found, I have asked Lt. Col. William Hausman, United States Military Academy, Dr. Dana L. Farnsworth, Harvard University, and Dr. Bryant M. Wedge, Yale University, to discuss the question raised by Dr. Rosenberg. Their discussions follow.]

Comments by Lieutenant Colonel William Hausman, United States Military Academy

Dr. Rosenberg's paper is most interesting and thought-provoking. The reader is impressed with the pervasiveness of the "disgruntlement" in those students who describe themselves as in poor spirits most of the time. Several other factors that might have offered us more information had they been available, or that might be considered in other studies of this nature, would be correlations with age, grade averages at school, and, ideally, with other types of diagnostic measures such as psychiatric or psychological interviews, projective tests, and perhaps the Minnesota Multiphasic Personality Inventory. These studies might give us some insight into whether this low spirit group was homogeneous and perhaps could suggest the incidence among them of students with severe personality disorders, possibly including a number of schizophrenics. Such an occurrence, which seems not at all improbable, would offer more information on the possible treatability of this group and the prognostic implications of these

attitudes. As such, it would offer a valuable addition to the clinical literature for the psychiatrist in student health work.

The suggestion that psychotherapy for such students and integration into the college community "are likely to be costly and time-consuming" should be reconsidered when we consider that the "low" group consisted of about 4 per cent of the total sample (66 in 1,571). Of these, I suspect a fair proportion would not accept psychotherapy if offered, and I am sure that another segment would be felt to be not amenable to psychotherapy, other than support, because of severe character disorder or psychosis. I believe that the rest could be well handled by a college psychiatric service, particularly if considered for group psychotherapy as an adjunct to, or substitute for, individual psychotherapy.

While the depressed individual seems to operate in an intropunitive fashion, the general effect is one of great hostility toward his environment. He attacks those who would be close to him and, while blaming himself (as in dissatisfaction with study patterns), also attacks his environment (the college and the other students). In doing this, however, he is the sufferer (as in cut classes, lack of social gratification, and so on).

In conclusion, I feel that this worth-while study should invite further research into the described group, including its dynamics and its operations in the college community. It also suggests that the clinician might well consider means to identify these people, so that consideration can be given to their early evaluation and, in selected cases, treatment.

Comments by Dr. Dana L. Farnsworth, Harvard University

Dr. Rosenberg's findings in regard to the attitudes of the depressed student toward his college are in agreement with such a student's attitude toward himself. Whenever any person is depressed, he has varying degrees of melancholy, hopelessness, embitterment, feelings of self-depreciation and self-criticism, a general slowing down of his mental processes, together with a sense of guilt. Hostile feelings which he may have toward those for whom he has much conscious affection are turned inward

upon himself, discharging some of his hostility and relieving some of his guilt. Feelings of hostility are readily projected out to the environment, in this instance to the college, and various criticisms result which still further add to the difficulties the student may be having in his attempts to carry on his life in a satisfying manner.

Depressions do not just happen to people in a random fashion. They have their origin in disturbances in interpersonal relationships, sometimes of a simple, more often of a complex, nature. They can be helped by appropriate treatment. As to "What can we do about it?" I think the answer is that we should consider it the proper responsibility of the college to develop psychiatric services and counseling systems that will make it possible for the depressed student to get the help he needs. This solution is costly and time-consuming but should not out-strip the resources of any university. How much is a student worth? It depends on whether he is your son or daughter or not. One student diverted from failure to success should go far toward justifying the salary of a psychotherapist for a year. A good health program can be supported by student fees which will not be prohibitive, which will not drain the funds of the college or university earmarked for conventional teaching or research, and which will provide for a proper psychiatric service. It is a question of values. For a given college, shall it be a theater (or some other facility) or a good health program? It depends on what the students and faculty want.

Since the reasons for depressions are reasonably definite and clear, it seems logical that at least some of them could be prevented if ways could be found to improve interpersonal relationships. This means developing more adequate means of handling hostility and aggression. It means a greater awareness on the part of a large proportion of our people of what elements constitute a satisfying family life. It means that we must find ways of implementing kindliness. Where is a better place than in our colleges and universities to learn how to keep from tearing ourselves apart by hostility and frustration? Such knowledge is available in part, more could be obtained, and college is the place to organize it in such a way that students may be in a position to

understand themselves and plan their own homes to facilitate the bringing up of children with trust, confidence, tolerance, and resilience, rather than with doubt, hostility, rigidity, and irresponsibility.

Comments by Bryant M. Wedge, M.D., Yale University

Professor Rosenberg sets out to demonstrate a "relationship between the student's degree of adjustment, as reflected in his attitudes toward various aspects of college life, and his expression of feelings of psychological depression." There is no doubt that he succeeds in doing so quite convincingly. The main questions which the study raises are: (1) what is the meaning of this relationship? and (2) what steps might be effective in prevention and/or management of student depression?

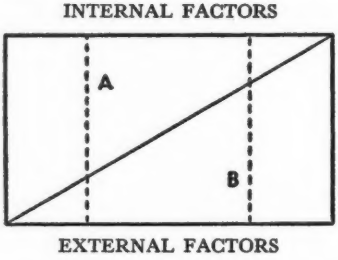
In his paper Professor Rosenberg treats the item of psychological depression as the independent variable and tends to imply that the problem is an individual internal one. However, he does consider the possibility that depression may be a reaction to disagreeable experiences with college life. Consequently, the question of whether the state of depression accounts for the negative attitudes toward college or whether the college experience is a causal factor in the depression remains unresolved.

In this paper the relationships demonstrated are between feeling tone and attitudes toward college. Now it happens that other studies have shown that the question of good or low spirits correlates highly with a number of other variables, including environmental factors. For example, an unpublished study by Davie at Yale demonstrates that the student who had his preparation in high school is more likely to report himself as in low spirits *at Yale* than the student who attended an independent (prep) school. It is possible that the reverse might be true at a state university, a question to be discussed shortly. In another study [1] it has been shown that military barracks architecture influences the distribution of response to a question concerning

[1] J. S. Davie, C. C. Rhead, R. Blake, and B. Wedge, unpublished study on relation between housing and mental health conducted at Laboratory on Housing and Illness, Sampson A.F.B., under auspices of Armed Forces Epidemiological Board.

spirits. Furthermore, it was shown in the latter study that the state of feeling alters markedly with the passage of time in a new situation. These findings suggest that reports of mood elicited by questions concerning the state of spirits are (1) influenced by environmental factors, (2) related to past experience, and (3) not necessarily fixed in individual instances.

It would appear that the further one goes in investigating the factors contributing to mood the more complicated the causal relations become. Basically, however, the feeling of depression can be viewed as a response to inability to satisfy needs, particularly those to belong. The circumstances which interfere with such satisfaction may be either internal (related to the personal conflicts of the person) or external (frustration from the environment). In circumstances where dual factors are integrated to produce a result it is useful to visualize the complementary role of each by means of a simple diagram.



The upper triangle represents the contribution of internal (neurotic) factors to the development of depression and the lower triangle the role of the environment. The vertical lines *A* and *B* represent hypothetical cases. In one diagram individual *A* and individual *B* may both report being in very low spirits. In the case of *A* internal factors such as the development from life experience of a tyrannical sense of guilt may interfere with accepting satisfaction, while in the case of *B* internal conflicts may contribute relatively little but the environment fails to offer satisfaction for his particular needs. *B*, for example, might be a foreign student on a campus which is unable to understand him or offer familiar routes to satisfaction. Thus the symptom "de-

pression" may represent the outcome of factors represented by any vertical position on the diagram.

Now, let us turn to a discussion of the question about what may be done to prevent or manage student depression. In regard to the internal or personality factors which contribute to the development of this state, it is clear in clinical work that these need not be regarded as fixed or immutable in the college student. Everyday observation will show remarkable changes in attitudes of individual students during college. The college period is a time of rapid personality development toward the consolidating of adult character structure, and there may be marked shifts in this structure in brief spaces of time. This flexibility lends itself to the resolution of internal barriers to satisfaction even when formal psychotherapy is not available. In fact, psychotherapy of the kind designed to alter the psychic structure is usually reserved for those cases in which satisfactory progress toward resolution of conflicts has been impeded by particularly unfavorable circumstances. However, supportive psychotherapy may be adjunctive to other campus resources in assisting students to get through rough spots and achieve spontaneous resolutions to internal problems. The nonmedical resources can offer considerable support to students in allowing them opportunity to achieve their own solutions. Some overburdened public colleges lose half of their students in the first year, obviously having given little opportunity for such recovery to occur.

As to external factors contributing to the development of depression, it is in this area that research of the kind reported by Rosenberg can make great contributions. It may be possible to identify the life circumstances frequently associated with the symptom; for example, background factors important in a particular college setting such as preparatory education, geographical origin (i.e., rural students may be quite at sea in some city college), family background, and the like. This can lead to increased efficiency in aiding the student in the selection of a college suitable to him and to the identification of particular groups which might merit special supportive attention, such as foreign students or students prepared in a special type of school.

Circumstances within the college associated with depression

may also be identified. For example, I recall a particular course in one college which never failed to precipitate considerable anxiety by powerful exposure to teachings concerning the unconscious. Certain courses of study or certain rooming situations may turn out to be of significance, as might also the necessity to carry a job or athletic participation.

Some generalizations may be made on the basis of experience. A well-developed counseling system for the first year is probably especially important. Students may be selected on the basis of a reasonable congruity of aims with those of the college; for example, instead of the joining of fraternities and extracurricular activities being evidence of integration in campus life as at Cornell, the students at another college might need to attend nightly prayers and study for missions. In general, the college which is interested in its students develops a series of devices which aid in their integration in campus life. The presence of a mental hygiene clinic is particularly helpful in representing this interest, sometimes even to those students who do not use it personally, and, of course, such clinics devote their clinical efforts to those fairly numerous special instances in which individual factors have prevented satisfactory solutions to life problems.

I am aware that I have gone far beyond Rosenberg's study in this discussion and have, in fact, been suggesting epidemiological studies with action aims. I do so because I think Rosenberg's paper stands on a scientific frontier in which sociological techniques will be applied to increase understanding of the cause and cure of the sometimes untoward effects of the coming together of persons and situations.

Health Forms and Student Health Services

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WHEN a patient brings his personal physician a health form to be completed for the purpose of procuring a new position, a life insurance policy, or for any other purpose in which the health blank is part of a selecting process, both he and the physician may be unaware of the fact that, for the sake of very temporary convenience, they are damaging a confidential and privileged professional relationship.

Usually both parties feel that if the facts are presented "in their best light" no harm will come to the patient's chances to obtain the contract he is seeking. (This is the basic purpose of the physician's ethical code regarding the inviolability of patient confidences: that no harm come to the patient because of information received by the physician and needed by him in the solution of the patient's health problems.)

Originally the statements required to complete these health forms were so general that no important confidential material was divulged. For this reason, they served little or no selective function.

Dissatisfaction with these forms originated in the selecting agencies, and they tried to improve results by changes requiring the release of increasingly specific health information. In doing so they exposed the basic dilemma: frequently they asked the same physician to serve in double capacity, as the simultaneous representative of the applicant for the job and of the selecting agency.

More than an ethical problem is involved. As soon as a patient

realizes that certain types of confidential health information may be used against him at a later date, he tends to withhold such information. His personal physician thereafter loses a part of the health history which may be essential to satisfactory handling of the case.

This general problem is an old one in student health services. In their earlier days many college health clinics served administrative as well as professional functions, with their allegiances divided between their patients and university offices. When health problems were associated with behavior which might bring administrative censure, students sought solution of health problems elsewhere. The college physician, in broadening his services to the university, had impaired his basic professional role. The reputation of college health services was often low.

Many factors have contributed to the later development of strong professional services in college clinics. However, the increasing confidence and respect of the university community toward its health service has usually gone hand in hand with the steps that service has taken toward divorcing itself from an administrative function and reaffirming its principal professional role.

Those health problems in which an individual's feelings and behavior play an important part outnumber all other health problems today. Their solution requires complete trust in the physician's discretion. If the patient feels that such very personal information is to be shared (for whatever well-meaning intention) with his dean, his coach, his teachers, or his future employer, he will certainly keep his own counsel.

Such sharing occurred in the past, but has been corrected. The sharing demanded by the health form persists. An example of the way in which it can interfere with good health service follows.

This year a graduate student consulted our medical clinic several times in the course of the early fall with complaints in which the emotional elements were patently high. It was suggested that she consult our mental hygiene division.

The patient pointed out that she could not do this, as she planned to apply for a fellowship and the health form included

specific questioning regarding treatment for emotional problems.

The privileged status of our medical records was then discussed, as well as the numerous safeguards established against betrayal of a confidential record. Her final reply was that she was still unable to use such health advice, as the health form required her to state directly whether she had or had not consulted a psychiatrist. She felt (quite correctly) that this would place her in the position of either having to lie or to endanger her chances for the fellowship.

This is only one of several specific instances coming to our attention in the past few years, where some type of professional advice has been avoided because it could not be sought on a truly confidential basis (i.e., without possible future harm to the seeker).

In order to preserve the quality of its professional services, the Yale Department of University Health no longer permits the use of its records in the completion of health forms used for selective purposes. To all requests for evaluation of the student's mental or physical health from his clinic record, the following statement is used: "It is the policy of this Department not to release information in this area of the health form on any health statement completed *prior to the acceptance* of the applicant in the school or position for which he is applying."

This step should not be considered as a rejection of community responsibility. Specific instances come immediately to mind in which a patient has an illness whose concealment may lead to serious consequences, either to himself or to others. Recognition of such cases and requisite action are frequently defined by law.

Regardless of legal definition, it is the physician's responsibility to take corrective action in all such cases. Such action, however, always involves and usually ends in public or private health agencies, so that no one beyond those bound by usual professional ethical responsibilities is concerned. The same course of action also usually serves the best interests of both the patient and the community.

Health evaluation is an important part of a selective process. Such evaluation, however, can only be performed by a physician engaged by the selecting agency, and not associated with the

applicant in any other professional capacity. This physician may request additional information from the applicant's personal health advisor, but he remains the final objective certifier to the applicant's satisfactory health status.

The best health criterion for selection lies completely outside privileged professional sources, in the candidate's work record—its quality and his regularity of attendance. When this record is combined with a few simple laboratory procedures and a physical examination, a reliable statement about *the present health status* can be made.

Much of the failure in present selective methods arises from forgetting that health is a constant on-going process. Health failures are not usually due to inadequate past selection, but rather to inadequate health facilities available to the individual in his new position. No selective process can make up for this.

In summary, these selective methods require re-examination because: (1) certain requirements are self-defeating, by encouraging future applicants to avoid certain forms of health service and by aggravating their health hazard through this delay and concealment; (2) they frequently place principal reliance for health information on a physician who cannot give them an adequate report without impairing his other professional obligations; (3) they place undue emphasis on a single health statement, tending to minimize the importance of continual adequate health supervision; (4) the information which they require the patient's physician to furnish at considerable professional cost could frequently be obtained through proper analysis of other, non-confidential data.

The problems in this important area require study by all interested parties, before a satisfactory solution can be reached. As a first step, student health clinics should define the limits of their own role in this procedure, with due regard to its compatibility with their principal professional responsibility.

Electrocardiographic Findings in Rubella, with a Discussion of Myocarditis in Virus Infections

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AT ONE time myocarditis was often invoked as a cause of unexplained illness and death, but with improved methods of clinical and pathological diagnosis, and with the development of a more critical attitude in clinical medicine, as exemplified in the teachings of Sir Thomas Lewis [1] and Paul D. White,[2] fewer and fewer cases were given this label, until a diagnosis of myocarditis (except in rheumatic fever or diphtheria) was looked on with suspicion. The reasons for this were, firstly, the recognition that the term myocarditis should be used only where true inflammatory changes, acute or chronic, could be demonstrated, as opposed to degenerative processes; secondly, the absence of characteristic symptoms and signs by which myocarditis could be recognized clinically; thirdly, the small number of cases shown to have myocarditis at necropsy; and fourthly, the rise of the understanding of the importance of coronary artery disease as a cause of myocardial failure.

However, some physicians persisted in the belief that myocarditis occurred frequently, e.g., Christian [3] quoted by Saphir;[4] and more recently it has come to be regarded as less of a curiosity. Thus in a standard textbook Morgan [5] acknowledged that the disease is more common than had been thought; he pointed out that many physicians think it of no importance even if it exists, though some writers [6,7] have suggested that it may lead to heart failure in later life.

The extensive studies and persistent writings of Saphir and his

associates [4,8,9,10,11] have helped to make "myocarditis" a more respectable diagnosis by pointing out that myocardial abnormalities, including true inflammations, were found much more commonly at necropsy than had been realized. Saphir [4] found myocarditis in 240 of 5,626 routine autopsies at a general hospital; the incidence is higher in hospitals admitting cases of infectious diseases. Of 1,402 cases of myocarditis in army pathological records, 75 per cent were neither rheumatic nor diphtheritic.[9] He showed, too, that myocardial lesions are found more commonly when diligent search is made for them. These writings also served to demonstrate that myocarditis occurs much more often than it is diagnosed clinically. Evidence of myocarditis was found in 3.3 per cent of 1,250 routine necropsies at Bellevue Hospital and 7.8 per cent of 1,000 necropsies at Willard Parker Hospital for infectious diseases; although the actual incidence of myocardial lesions was probably higher since special search was not made for them, a clinical diagnosis of myocarditis was made in only 0.02 per cent of patients at Bellevue and in one of 11,398 patients at Willard Parker in a similar period.[12]

These reports and the increasing availability of the electrocardiogram (ECG) have given rise to renewed interest in myocarditis. Among the early reports were those of Candel and Wheelock [13] and Young [14] describing electrocardiographic changes in small series of patients with acute infections, some of whom showed myocarditis at autopsy after sudden death. Since then many investigations have been published, but a search of the literature has revealed no reports of the findings in rubella, (German measles) save a brief mention by Rosenberg [15] without report or reference. This, previously regarded as the most benign of diseases, rarely complicated,[16] has assumed a more sinister character in recent years owing to the discovery of its disastrous effects on the embryo in some cases. It may affect the developing heart; thus in the hearts of five fetuses whose mothers had had rubella in early pregnancy, septal defects were found in four;[17] but there is no evidence so far that the adult heart is attacked.

The occurrence of a small epidemic at Cornell provided the opportunity for electrocardiographic study of several cases who

were admitted chiefly for isolation, not because their clinical severity demanded medical care.

PRESENT STUDY

Material

Forty patients admitted to the Cornell University Infirmary with a diagnosis of rubella were chosen at random for study. All had a typical history of slight malaise with or without mild headache or sore throat, a characteristic rosy rash, and enlargement of the posterior cervical, suboccipital, or postauricular lymph nodes. Of these, one, whose clinical course differed in no way from that of the others, refused to take part, and another was rejected because, although his initial presentation and course were those of rubella, his sore throat became much worse and a blood count revealed a lymphocytosis with Downey cells. The remaining 38, all of whom recovered rapidly without evident sequelae, comprised one Hawaiian and 37 white American students aged seventeen to twenty years, of whom 9 were female. In none was there any abnormal cardiac sign, nor any history suggesting heart disease. None had a high fever; all were eating and drinking normally and none were hyperventilating. There was no reason to suspect extracardiac effects on the ECG.

Method

In each case a tracing was made within twenty-four hours of admission with the patient supine. A Sanborn "Visocardiette" was employed, and the twelve conventional leads (standard limb leads 1, 2, and 3 and univariant leads aVL, aVR, aVF, and V1-6) were used in all cases. In seven patients who were still in the infirmary forty-eight hours after the first ECG, a second tracing was made. The standards accepted for a normal QT and QU interval were those of Lepeschkin;[18] the standards for all other functions were those given by Kossman.[19] The PR, QRS, and QT intervals were measured in lead 2, the QU interval in V3, and all other functions in all leads, i.e., the amplitude of the P,Q,R,S, and T waves and deviation of the ST segment, if present.

Results

In one case, a boy of nineteen, the R wave in V5 measured 32.5 mm. when the maximum normal is 29 mm. As the maximum at the age of twenty is 33.6 mm., this is not considered significant. No other abnormality was detected in any patient by the given criteria, and in those patients in whom two tracings were made, no marked differences between the two were found. There was a tendency to sinus bradycardia, sinus arrhythmia, a short QT interval, and a vertical heart position, which are to be expected in the age group in question.

Conclusion

The only inference that can be made from these results is that there is no electrocardiographic abnormality characteristic of rubella, so that in the future if abnormalities are found they must be considered incidental or due to complications.

MYOCARDITIS

It is acknowledged that myocarditis is common in rheumatic fever (and possibly other illnesses due to streptococcal infection) and diphtheria. It has been found in 100 per cent of fatal cases of scrub typhus [9,20] and is common in leptospirosis: Bertucci [21] in a review mentioned round cell infiltration with changes in the ECG; Sutcliff and his colleagues [22] reported a case and referred to others, and Saphir and Gore [9] found myocarditis in 7 out of 8 cases in a series of army necropsies. In Chagas' disease, Trypanosoma cruzi may lodge in the myocardium and produce necrosis.[12]

In infections more common in temperate climates, myocarditis diagnosed clinically, electrocardiographically, or at autopsy has been described with increasing frequency. Fine and his colleagues [23] reviewed some of the literature to 1950 and reported over 80 cases of their own with many different acute bacterial and viral infections, of which one-third had ECGs thought to be definitely abnormal due to myocarditis; most of these had clinical signs also, such as a soft first apical heart sound, hypotension,

and gallop rhythm. In some of their cases which came to post mortem, inflammatory or degenerative changes were found in the heart muscle in line with the electrocardiographic abnormalities. However, the number of cases of any one disease in their series was too small to be significant. Neubauer [24] reported 200 cases in which he made a diagnosis of myocarditis by clinical or electrocardiographic signs. Most of these cases were of diphtheria or scarlet fever, but 24 of pertussis and 4 of measles were included. All had bronchopneumonia, which may have contributed to the myocardial changes.

Saphir and Gore [10] reported 35 cases of definite myocarditis found at necropsy in patients dying (fifteen of them suddenly) during acute nasopharyngitis or tonsillitis. Some of these infections were streptococcal, others may have been viral. Finland and his colleagues [25] quoted cases of myocarditis in animals with foot-and-mouth disease and experimental virus infections, while Saphir in a review [11] mentioned that viruses have been isolated from the hearts of animals with myocarditis.

Lyon [26] reviewed the subject of virus myocarditis, reporting five cases of his own. He suggested that coronary arteritis and autonomic derangement contribute to the picture and that ergot and belladonna might be used. He also postulated a tropism for heart and nerve tissue in certain virus strains.

Easby and her colleagues [7] made ECGs in 47 patients in whom a definite or highly probable diagnosis of virus disease had been made. Of these 21 had tracings described as abnormal. In 4 cases (influenza A, mumps meningitis, polyneuritis, and acute lymphocytic meningitis) they considered the changes definitely indicative of myocarditis. In every case the ECG gradually reverted to normal.

Common Virus Diseases

Apart from a large group of clinically ill-defined conditions such as the common cold and APC infection, it is thought that of the common acute infections influenza, measles, mumps, poliomyelitis, and some cases of primary atypical pneumonia are definitely, and rubella, varicella, infectious hepatitis, and infectious mononucleosis are probably, caused by viruses.[27,28]

Influenza

In two cases [25] in which Influenza A virus was isolated from the lungs after death following respiratory infection, the hearts showed convincing myocarditis. There was no evidence of bacterial infection in either. One had a normal ECG nine days before death.

Measles

Degen [29] described the autopsy findings in 100 cases of measles. In 91 in which there was a record of sections of the heart, 4 had cellular infiltration of the myocardium. He noted that fatalities were usually due to secondary infection with hemolytic streptococcus. Giustra and Nilsson [30,31] described an eventually fatal case in which severe arrhythmias, followed by right and left bundle branch block at times, began twelve days after the onset of severe measles. Bengtsson and Berglund [32] made ECGs in 451 cases of measles, of which 409 patients were under fifteen years of age and 234 showed complications, though those with a bacterial complication or recent streptococcal infection were excluded from the series. Definite changes were found in only 6 adults and 2 children. Goldfield and his colleagues [33] studied 106 cases in which an ECG was made every two or three days. Judging by criteria which accepted a wide range of normal values, they found changes in 13 of 48 uncomplicated and in 7 of 58 complicated cases; of these 7, 6 were patients with encephalitis, which is of interest in view of a recent report of encephalomyocarditis in humans,[34] the work of Bengtsson and Örndahl in mumps,[35] and Lyon's suggestion of cardioneurotropism.[26] These authors regarded the case of Giustra and Nilsson [30,31] as being one of subendocardial fibroelastosis. They also quoted the work of Ross,[36] in which various abnormalities were each found in about 30 per cent of 71 children with measles, and criticized his results as using too strict criteria of the normal, i.e., those of Ashman and Hull.[37] Even with less strict criteria, Goldfield *et al.* found abnormalities in 19 per cent of their cases, while Bengtsson and Berglund found less than 2 per cent in theirs.

Mumps

Wendkos and Noll [38] described one soldier with abnormal

ECGs in a series of 15 with mumps. They quoted the anatomical studies of Manca,[39] who found interstitial myocarditis. Rosenberg [15] described 2 cases of mumps in whom ECGs were made because of precordial pain and in whom conduction disturbances were found. After this, ECGs were made on 104 adults with mumps; serial tracings were taken in 46. Of these patients, 16 had abnormalities taken to indicate myocardial involvement and three had other abnormalities. In most cases the tracings were normal after five weeks. Felknor and Pullen [40] described a boy of fourteen with mumps and divers complications including changes in the T waves of the ECG which persisted three weeks later. Irvin and his associates [41] described a case of serologically proved mumps without parotitis, in whom there was orchitis and severe toxicity. Serial ECGs showed transient T wave inversion followed by lengthening of the PR interval, with apparent recovery. Bengtsson and Örndahl [35] found electrocardiographic evidence of myocarditis in 6.6 per cent of the adults and 2.8 per cent of the children, in a series of 564 cases. Most of those with an abnormal ECG had encephalitis. Changes were commoner in girls than in boys, and none in whom orchitis was the only complication had an abnormal ECG.

Poliomyelitis

Although poliomyelitis is by far the least common of the virus diseases considered here, the studies on myocardial involvement are the most voluminous. In 1910 Robertson and Chesley [42] reported myocardial damage at necropsy. Saphir and Wile [43] examined 7 cases of poliomyelitis post mortem and found the myocardium inflamed in 6, the chief changes being perivascular and interstitial infiltration with lymphocytes and polymorphs. The first electrocardiographic study seems to have been that of Battro and his coworkers,[44] who found changes suggesting myocarditis in 4 of 20 cases. Bradford and Anderson [45] found alterations in the ECG in 12 per cent of all, and 75 per cent of fatal, cases. Manning and Yu,[46] following a previous smaller study,[47] performed serial 12-lead ECGs in 100 children and 50 adults, a total of 696 tracings. In 116 cases there were abnormalities; 21 of these were normal save for sinus tachycardia or brady-

cardia. Most returned to normal in four weeks. Higher proportions of changes were found in adults and in those with bulbar involvement. In 81 cases serum potassium estimations were made; the level did not seem to be correlated with T wave changes. Six patients in this series died; 5 of these had had abnormal ECGs. In one there was myocarditis at autopsy; another with similar pathological changes had had no ECG. Weinstein and Shelokov [48] reviewed the literature, quoting the early reports,[42,44] and reported their own series of 85 cases in which about 30 per cent had abnormal ECGs. Jungeblut and Edwards [49] isolated poliomyelitis virus from the myocardium in 3 fatal cases. Salmi and Malossi [50] reported 27 per cent of abnormal ECGs in 62 patients. Teloh [51] found the incidence of acute myocarditis at post mortem to be 55 per cent in 47 cases, and he reviewed 206 cases, among which 98 had myocarditis. Fox and his colleagues [52] found electrocardiographic changes in 32.4 per cent of 189 cases and myocarditis in 38 cases of 70 with bulbar poliomyelitis examined at necropsy; in 25 the changes were described as slight. Jurow and Dolgopol [53] found acute focal myocarditis in 32.9 per cent of 73 fatal cases. Dönhardt [54] reported a pathological ECG in 24.6 per cent of nonparalytic cases, in 34.5 per cent of paralytic cases, and in 88.2 per cent of those with respiratory disturbances. Schaper and his colleagues [55] found electrocardiographic changes in 28 of 52 cases and myocarditis in three of four at autopsy. Hildes and his coworkers [56] described a syndrome of cardiovascular collapse confined to bulbar poliomyelitis, characterized by a transient rise of temperature, pulse, and blood pressure, followed by shock, often with pulmonary edema. Of their 28 cases, 6 survived; of the 20 autopsied, 14 had myocarditis. This, and vasoconstriction due to medullary involvement, were thought to cause the syndrome.

Primary Atypical Pneumonia

Diagnostic criteria in this malady are not well established, and in some series of cases, the diagnoses fall short of desirable standards of accuracy. Most of those described by Painton and his coworkers [57] seem likely to be of virus origin, though no agglutination studies were done. ECGs were made in 40 random cases

and in 24 persistent cases. Twelve of these, all of whom had radiological changes in the lower lung fields, had abnormal tracings: mainly ST-T changes and conduction defects.

Varicella (Chicken Pox)

Hackel [58] reviewed the autopsies of 11 patients who died, from various causes including ruptured appendix, with varicella. He excluded 2 because of concomitant diphtheria and 2 for other reasons. Of the remaining 7, 4 had mild myocarditis and 3 had extensive myocarditis. No similar changes were found in 6 control subjects who died of injuries. The only report of electrocardiography in varicella that has been found is that of Vindigni,[59] concerning a girl of ten who became short of breath while recovering from a typical attack. An ECG showed ST-T changes interpreted as being due to myocarditis, with a return toward normal a month later.

Infectious Hepatitis

Dehn and his colleagues [60] made ECGs in 11 students suffering from hepatitis and found a PR interval of 0.2 sec. in one (which later became 0.16 sec.), and in 9 students they found T waves which were low compared with their height after recovery. Adler and Lyon [61] reported clinical and electrocardiographic changes, especially a prolonged QT interval and high T waves considered to be due to myocarditis, in 8 cases. In 30 of his 38 patients with epidemic and serum hepatitis, Abendroth [62] found changes in the ECG interpreted as being due to heart muscle damage; he thought that metabolic rather than infective processes played a special role. Lyon [63] and Diaz-Rubio *et al.*[64] considered that abnormal ECGs in liver disease may be due to altered levels of plasma proteins, especially low albumin; however, Saphir and his colleagues [65] described acute myocarditis in 4 out of 6 fatal cases of infectious hepatitis. Two of these had ST segment depression in the ECG, and one also had A-V dissociation.

Infectious Mononucleosis

Like primary atypical pneumonia, this disease has disputed

diagnostic criteria, so varied results are to be expected. Wechsler and his colleagues, in their excellent study,[66] made ECGs in 223 patients, serially if the first was abnormal. They found that 39 patients had abnormal T waves, 8 a prolonged PR interval, and 6 both. These changes were unaffected by belladonna. Other changes, such as depression of the ST segment, were not considered significant. Evans and Graybiel [67] studied 100 cases and found 4 with abnormal electrocardiograms. One had a rub, and they thought that the damage was pericardial in all 4. Jaffe and his colleagues [68] found that of 22 patients, 9 had pronounced T wave deviation and 2 had a prolonged PR interval, and Bennike [69] found electrocardiographic changes in 10 of 166 patients studied. Custer and Smith [70] reviewed the reports of 8 autopsied cases in which microscopic sections were made of the heart. Myocardial infiltration was found in 6, including one case of an airman who apparently had recovered from infectious mononucleosis but was killed in a flying accident.[71]

DISCUSSION

That myocarditis occurs in acute infections there can be no doubt; but how frequent it is in that vast majority of patients who survive their illness cannot yet be determined. Though clinical signs may suggest myocarditis, a confident diagnosis cannot be made by their presence alone or excluded by their absence. Given electrocardiographic changes are considered insignificant by one author and diagnostic of myocarditis by another. Even the limits of the normal are not generally agreed.

The Importance of Myocarditis

It may be questioned whether there is any point, other than academic interest, in making a diagnosis of myocarditis, since no specific treatment is available, and it seems that, if myocarditis is common, most patients must recover completely. There are two reasons for studying this problem further; the first is that if acute cases are detected it may be possible to prevent some deaths. Most deaths from acute myocarditis result from either heart failure or, probably, ventricular fibrillation or cardiac

standstill. It is possible that more prolonged bed rest and other appropriate treatment may save some lives. The value of ACTH is being investigated.[72,73]

The second is that it would be desirable to determine whether or not myocarditis may produce ill effects long after the acute phase has subsided. Christian,[6] in an address to the American Association of Physicians, pointed out that hypertension and coronary artery lesions are causative in not more than three-fourths of patients with chronic nonvalvular heart disease. He put forward the hypothesis that in the remaining cases a series of alternating dilatations and hypertrophies has occurred, which may often originate in acute inflammatory or degenerative changes in the myocardium. He emphasised that the myocardium is vulnerable for two reasons: first, the muscle must contract rhythmically for a lifetime without rest; and second, hypertrophy of the muscle fibers is not accompanied by increase in the size or number of the capillaries, so that a nutritional strain is thrown on the muscle cell. The strain is increased if there is inflammatory exudate between the cell and its blood supply. Malnutrition may lead to dilatation; this in turn may cause more vigorous contractions and lead to further hypertrophy, with eventual failure.

Whether or not this hypothesis is correct, there are many cases of myocardial failure which, a hundred years ago, would have been called "chronic myocarditis" and now are equally uncritically labeled "arteriosclerotic heart disease." Possibly presbycardia is a real entity; on the other hand, diffuse myocardial fibrosis may be no more a natural concomitant of aging than is coronary atherosclerosis.[74]

Myocarditis and Myocardosis

The results quoted above are indications that myocardial damage occurs in many common virus infections. The ECG cannot distinguish inflammatory from degenerative processes. Blankenhorn and Gall,[75] who referred to degenerative changes as "myocardosis," found electrocardiographic abnormalities in nearly 100 per cent in both inflammatory and degenerative conditions; in their cases the incidence of infectious disease was 60 per cent

in myocarditis and 30 per cent in myocardosis. It is highly desirable, in the interests of linguistic precision, to restrict the term "myocarditis" to cases with cellular infiltration of the myocardium, but for the purposes of Christian's hypothesis, either form of damage is equally important.

However, from the results quoted, little can be deduced of the frequency of either myocarditis or myocardosis, nor can we say whether myocardial failure in the later years of life is a consequence of one or the other. The conditions under which ECGs were taken, and the number and designation of leads employed, varied widely from one series to another; authors have varying criteria of what constitutes a normal tracing; in some cases these are stated, in others not.

Extracardiac Factors

Furthermore, in some reports adequate care has not been taken to exclude those extracardiac factors influencing the ECG, such as acidosis and alkalosis,[76] variations in the levels of circulating electrolytes,[77,78,79] hypoxia,[80] and mechanical displacement, including hypotension, which affects the pressure gradient.[81] Drugs may alter the ECG; the effects of digitalis and quinidine are well recognized, and toxic changes may be produced by drugs used to treat acute infections, such as sulphonamides,[82,83] penicillin,[84] emetine,[85,86] and antitoxin.[87] Fever has been found to affect the ECG; Clagett [88] and Schweinlein [89] found changes in occasional patients undergoing artificial hyperpyrexia, some of which were attributed to coronary occlusion. Fine and his coworkers [23] found no significant change in 17 of 18 hyperpyrexial subjects investigated; the other passed into a "shocklike state." Freedberg and his colleagues [90] reported transient changes during artificial fever induced by typhoid vaccine; however, changes attributed to fall in blood pressure were found [81] even when fever was prevented by amidopyrine. It must be considered that mild fever alone is unlikely to produce any changes. Semistarvation affects the ECG,[91] and a normal meal produces small but significant changes.[92,93,94] It seems there are no published data on the duration of these changes, and in the present investigation it was thought that it would be desir-

able to eliminate the effects of food as far as possible by taking the tracings at a time when the changes produced by breakfast had subsided. Accordingly, a preliminary study was made, in an attempt to determine how soon after a meal the changed functions would return to the fasting value. In 6 fit young adult males ECGs were made before a normal breakfast (i.e., after a fourteen-hour fast) and at hourly intervals afterward, no iced drinks or smoking being permitted. In most cases the changes to be expected [94] occurred; but even in this small series the individual variation was so great that no answer could be given. Thus in most subjects most functions were still different from their preprandial values four hours after the meal, i.e., at lunchtime: but some functions had returned to these values and stayed there, and a few had overshot them or returned to or beyond the levels reached one or two hours after the meal. For a true base-line ECG the tracing, it seems, should be taken with the subject fasting. This was not done in the present investigation, as the standards of normality used do not specify the interval after food.

Suggested Future Studies

In view of the extreme frequency of nonvalvular heart disease it would seem desirable to conduct further investigations to confirm or refute Christian's hypothesis, that is, to determine the frequency and consequence of myocardial damage in common acute infections. The reports to date have given clear indications that some damage occurs, perhaps commonly; there is no point in repeating these limited small-scale studies. Future work might be on these lines: first, some method should be found of diagnosing myocardial damage with confidence and accuracy. At present electrocardiography gives the best hope of this; however, electrocardiographic changes are sometimes found without corresponding anatomical abnormalities.[46,95] This may in some cases be due to insufficiently meticulous post-mortem examination of the heart,[10] to extracardiac effects on the ECG, or to inadequacies of our electrocardiographic technique or interpretation. Further and more detailed studies are desirable on the limits of the normal in restricted population groups and on the diurnal variations

and effects of events in normal life. For example, tables of normal values usually cover wide ranges of age and take no account, for example, of whether the tracings were taken when the patient was fasting or after he exercised. It may be that serial studies are necessary in all clinical cases, so that an attempt may be made after recovery to assess the normal limits for each individual investigated, for only rarely will tracings taken before the illness be available. Perhaps some biochemical method [96] or new physical tool such as high fidelity electrocardiography [97] or vector-ballistocardiography [98] may prove more reliable in the diagnosis of myocardial lesions.

When methods and diagnostic criteria are established, a large-scale co-operative investigation could be instituted, using patients from infectious disease and pediatric institutions, where cases of common acute infections are often found. Medical teams devoted to what Sir Heneage Ogilvie [99] has called "ephebiatrics," i.e., service units and college health organizations, could also play a useful part. Thus a reliable estimate of the incidence of heart muscle damage in acute infections could be made; and follow-ups, where possible, would show whether or not non-valvular heart disease in later life is commoner in those whose myocardium is affected than in those who escape. It would take many decades to produce results, however, and it is to be hoped that an answer to the problem will be to hand before this. Experimental work in animals with a shorter life span than ours may provide this answer.

SUMMARY

A review is made of the literature dealing with myocarditis, particularly in acute virus diseases. It is concluded that myocardial damage occurs in many cases, and a hypothesis is quoted that serious long-term damage may ensue, accounting for many cases of heart disease in later life.

In an original study, electrocardiograms were made in 38 cases of rubella. The tracings were all considered to lie within normal limits.

Extracardiac factors affecting the electrocardiogram are dis-

cussed, with particular reference to food. Suggestions are made for possible future investigations.

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Case Reports of the Cornell University Infirmary and Clinic

Tuberculosis in College Students

Dr. Darsie: "As you all know, I check the students who come with a history of chest disease and I also see the ones who are referred from the survey chest x-rays. We see a number of such cases and would like to present this boy as an example of what occasionally occurs. He entered Cornell in September 1953 aged eighteen years and gave a history of having had a lesion in the apex of the right lung discovered in a routine chest x-ray in November 1950. This lesion had been followed by his family physician with periodic x-rays. No treatment had been required prior to his entering Cornell. The family doctor in his report of the physical examination gave the diagnosis of a primary tuberculous focus, and he considered it a healed fibro-calcific lesion. Under these circumstances we followed this boy by repeated chest x-rays. They were done four times in each of his first and second years and were read as showing no change in the lesion in the apex of the right lung.

"The boy got along well until January 5, 1956, when he came in with a history of a sticking pain in his right lower chest which was caused by deep breathing or coughing. It had been present for one week. He had had no respiratory infection and his cough was minimal, but when he did cough it was quite painful. His lungs were clear on physical examination. He had a chest x-ray which Dr. Showacre will show us presently. It showed an increased area of involvement in the right upper lobe. Initially we were concerned that this might be an atypical pneumonia, so we repeated the x-ray ten days later and the lesion was still pres-

ent and unchanged. On the sixteenth, Dr. Costa of the Biggs Hospital staff reviewed the films, and he requested that we get additional x-ray views including a lateral and a lordotic film showing the apex and that we get a series of gastric washings, a sedimentation rate, and a tuberculin test. These things were done. The tuberculin skin test was positive in the first test dose. Gastric washings were sent to Biggs Hospital for culture and to date they have revealed no growth. The sedimentation rate showed a border-line increase, 16 mm. in one hour. We repeated x-rays on January 25, and since it was the period between terms we advised him to take his Cornell x-rays to his family doctor to see what his point of view would be. Dr. Costa felt that this should be done, since the family doctor had advised him previously and should continue his supervision of the case. The student did this, and February first the family physician telephoned me and concurred in our impression that this boy definitely had a spread of his disease or a new area of disease. In view of the minimal symptoms and the small lesion, he felt that it would be satisfactory for the boy to continue in school, if he was sure to get nine hours sleep each night and to rest during the day. He was placed on Isoniazid and para-aminosalicyic acid. The family physician also stated that if the sputum cultures became positive the boy should withdraw from school.

"The boy has gone along uneventfully since that time. We are checking his chest x-rays every two months. Will you show the films, please, Dr. Showacre?"

Dr. Showacre: "Some of you are going to have a little difficulty, especially in the initial film, if you are any distance from the view box. The lesion is quite small, being a small circular area of increased density at this point in the right apex 8 or 9 mm. in diameter. This had been static since it was first discovered three years prior to this. We did get the January 1952 film from his home physician, and at that time the area of infiltration was about 1 by 1.5 cm. in size, which is a little larger than in our first film in September 1953. It stayed the same from September 1953 until June 1954, when there was a small area of very slightly increased density immediately adjacent, which we do not see in later films. And in May 1955 there was a more definite

small round area; this also disappeared. I would like to ask Dr. Lincoln later about these little round areas that keep popping up and then disappearing. What is their significance? Here is the x-ray taken in January 1956. Notice this area which looks like an early atypical pneumonia. An x-ray nine days later shows no change. An atypical pneumonia would have changed some. This later film in March shows considerable clearing, but the original area is still present and unchanged."

Dr. Darsie: "To summarize, we considered this to be a chronic low-grade tuberculosis with recent activity, and there is some disagreement concerning the management of it. Dr. Costa felt that if he, himself, had a lesion of this sort he would prefer to go to bed for a time and perhaps be more sure of getting over this. The student's personal physician felt otherwise. Dr. Costa said that this is a problem that will come up with increasing frequency during years to come now that drug therapy is so widely employed in treating tuberculosis. He felt that we should have a definite policy to help in decisions regarding entering students with a history of tuberculosis and recent or continuing drug therapy and also regarding students, such as this one presented today, who develop active disease after being here. Should the new student be permitted to enter as a full-time student? Should the old student be allowed to continue school?

"We have another case at the present time which is quite similar to the one just presented. The second boy has been here a couple of years and developed an active process quite similar to this boy with the single exception that he had a sputum which was positive on culture only. The same problem arises with him, and so we thought in order to make up our minds as to what our policy as a medical staff should be we should get the best information we have. I have asked Dr. Lincoln and Dr. Toll to come over and give us what information and opinions they have on the subject."

Dr. Lincoln: "This seems to me to be perfectly typical of the problem of tuberculosis. It is a thing we have seen for many years and handled in many different ways, with varying degrees of success. Let's go back just a little bit to some fundamental remarks about which I personally feel rather strongly. If we are

going to handle tuberculosis, I think we owe it to our patients to understand what tuberculosis actually is. By definition it is an infectious disease which is chronic and is characterized by remissions and relapses. If we keep that definition in mind then I think we are less apt to get led astray by fads or popular theories that may not have all the substance which they appear to have at the outset. Tuberculosis is principally an air-borne disease. In some few parts of our country and in some parts of the world it is a food-borne disease, but as we know life here it is principally air borne. Ninety-six per cent of all tuberculosis is pulmonary, and approximately the same percentage—a little less—of pulmonary tuberculosis is in the posterior segments of the lungs. We see relatively little tuberculosis in the anterior segments of the lungs. To me, one of the big problems in tuberculosis is that as we see patients and people we see a tremendous number who are tuberculin positive, which means that at some time or other they have been infected with the tubercle bacillus and that therefore within their bodies there must have occurred episodes in which tubercle bacilli were killed. The products of that destruction have entered the blood stream and thus set up the hypersensitive response to the protein of the tubercle bacillus. Now only a very small percentage of those people who are infected ever develop tuberculosis, and I haven't the remotest idea as to why that situation exists. Dr. Medlar, of our staff, explains part of it on the basis of pure chance. Of the inhaled tubercle bacilli which actually get to the pulmonary fields, those organisms which lodge in the anterior and inferior segments the body handles well, and clinical disease does not become manifest; those bacilli which lodge in the posterior and superior segments of the lung are handled much less well. I can buy that concept up to a point, but it still does not explain the whole situation. What separates the fellow who gets clinical tuberculosis from his brothers? I have a feeling, and I can't prove it at all, that the patient with clinical tuberculosis is inferior in some respects in his ability to handle the tubercle bacillus. What that inferiority consists of I don't know.

"Now we see the evidence of pulmonary tuberculosis on x-ray, and I think it has been pretty well demonstrated and might

almost be called a fact that the basis of what we have seen radiographically here is the characteristic lesion of tuberculosis in the chronic cases—a mass within the parenchyma surrounded, except for the bronchial entry, with a fibrous capsule. That is the basis of the spread. Bacilli living in this necrotic area escape through the bronchus, never so far as I know through the capsule, and invade the healthy portion of the lung. Necrotic material itself may escape, and I have a hunch—you asked me to comment on this little nodular shadow which appears—I have a hunch that some necrotic material containing no live bacilli may escape, be inhaled, and cause a reaction, but because it is bacilli free it heals by resolution without residue. Perhaps even a few viable bacilli might be present but not enough to stir up infection.

"Let's consider the latency aspect of this case. This patient was first found to have infection in 1950. It was latent until 1954, when the first change in the x-ray was noted. Why didn't this happen in 1952? Why didn't it march right along from the original infection, whenever that may have occurred, or why didn't it wait until 1959? The factors that contribute to this latency we know nothing about. Here he spreads typically from a radiographic point of view; yet his gastric culture is negative, and you might have to take gastric cultures once a week for a year in order to get one positive. We can show you many cases with an open cavity and a positive smear that haven't spread in five years. Now it would seem easy for me to understand why a person with a smear positive sputum and definite proof of cavity should spread at anytime, but the mystery to me is why they don't spread all the time instead of rarely, but here with our laboratory techniques we are unable to recover the tubercle bacilli in a patient showing recent spread of infection.

"Now morphologically we can explain it, physiologically or mechanically we cannot explain it, and immunologically we cannot explain it. Why would this caseous mass within the lung tissue remain latent for a long time and then all of a sudden break down and escape through the bronchus? We have no idea. This brings in also the matter of primary and reinfection tuberculosis. In view of the patient's age, I strongly suspect that what was seen in 1950 was an end result of a primary infection, but

morphologically it is no different than what we would see in the daughter lesions. Somewhere somebody got the idea that primary tuberculosis always is benign, that it can be ignored and forgotten. This was forgotten but was it healed? Clinically, yes, but pathologically this is an unhealed primary, I believe. I can't prove it. For some reason material leaks out of such a necrotic area, we get an abnormal x-ray, a changing x-ray, and we know that there is active tuberculosis. We have gone so far at Biggs—and it may seem radical to you—as to resect some lesions like this after a short period of chemotherapy in order to study the tissue microscopically. In at least a quarter of those cases we resected on a study basis we couldn't prove tuberculosis by recovering the tubercle bacilli prior to surgery, and I was always looking for the case which was not tuberculous. We didn't find one, so the judgment that the series of observations we have here is produced by tuberculosis, I think, is rather sound. We don't have to have absolute proof to make an excellent clinical judgment that this boy has tuberculosis.

"If we are going to handle this type of thing properly—and I hope I can say this just the way I mean it—we can't treat the x-ray only; we can't treat the sputum only; an elevated sedimentation rate only, if there is one; a fever only, if there is one; a cough only, if there is one. Neither can we treat properly this patient as an individual. We have to think of tuberculosis in terms of its presenting symptoms for an immediate program, but we should never forget that this fellow got tuberculosis from somebody else and that he has the potential until he is cured to give it to somebody else. So from a public health angle we have to so manage him as to be conscious and aware of these public health aspects. We also must think not only of the present illness or the acute phase, we must think of this fellow's entire life. First abnormality found in 1950; first clinical break in 1954. What's ahead of him? If he has to go into heavy manual labor, forgetting for the moment that he is a Cornell student and probably won't get into heavy manual labor, then perhaps one line of handling would be indicated. If he were a severe diabetic that might influence the handling. If he were colored, that might influence the handling.

"The tragedy of tuberculosis, to me, is not that it kills; some people can get killed taking a bath. The tragedy of tuberculosis lies in exactly what it has done to this boy. Having done it in 1954, what assurance do we have that it won't do it again in 1964 or 1971 or at some other time? So that whether we use drugs, whether we use bed rest, whether we use pneumothorax, whether we use thorcoplasty or what have you, let's think not just of the present illness, let's think not just of this boy now. Let's think in terms of his family, present, past, and future, and of the community, present, past, and future. That's a big order, and it means more than drugs. It means more than a bed in a hospital. It means a planned existence for him under medical supervision for as long as he is going to live. It means social service, adjustment of his training to whatever he likes to do and can do with a physical handicap, adjustment as to recreation, and all that sort of thing. Now, when it comes down to the actual handling of the acute phase of this situation, I don't think there has ever been a time when doctors were more at sea. Witness the argument at the present time with respect to picking out that one program which promises better results than all others.

"You remember that pneumothorax started to become popular in 1920 or thereabouts, and it wasn't until 1940 that people working in the field of tuberculosis were willing to admit that it wasn't an answer to the spread of disease. Doctors had to be shown that after twenty years experience the success rate was only 26 per cent before they generally would admit that pneumothorax wasn't much. In minimal tuberculosis such as this, bed rest alone gave the following results. After ten years between 25 and 30 per cent were either dead of tuberculosis or had active disease and the other 70 or 75 per cent were arrested, and yet we constantly hear, "minimal tuberculosis, there's nothing to it, you have a 90 per cent chance of getting well and staying well." It just isn't so. Of course in this type of lesion you never would do thorcoplasty, but you would use drugs.

"It is only since 1953 that we have had really good drug therapy. From 1949 to 1953 we were learning. We have had a lot of good drug therapy since about the time this fellow first showed activity of the disease, and here we are half through 1956

and yet we do not know the relapse rates and we will not know them for a long time. Our ten-year relapse rates on thorcoplasty, for example, show that 70 per cent are well and working ten years after surgery. Something has happened to the other 30 per cent. But thorcoplasty is a lot bigger problem than this, morphologically it is all the same, it's just bigger in the sense of more volume and more damage to the lung tissue. What the relapse rate is going to be with any of the drugs or any combination of the drugs, nobody yet knows. So in considering the management of this type of case at this time, you can look around and find people like myself who believe strongly in hospitalization, at least until the patient learns the way of life that tuberculosis demands. Not for as long hospitalization as we used to believe in, and as much for education as for therapy. Then you can go to the other extreme and find doctors who leave the patients at work and depend on the drugs. But there is no morphological or bacteriological evidence that drugs have changed the fundamental character of tuberculosis. Drugs are not bactericidal, they are only bacteriostatic, and the patient can escape from the effect of drugs while drugs are still being given or at a later date. Some tuberculosis specialists believe in sanatorium or hospital care, some in home care, and some in ambulant care. In the April 1956 issue of the *American Review of Tuberculosis* there is a statement by the two committees on therapy and standards of care. It is only about a page and a half or two pages and well written. I recommend it to you. It sums up the whole thing. And that article is as eloquent in what it doesn't say as it is eloquent in what it does say. It provides for hospital care; it provides for home care, and very notably it says nothing about ambulant care.

"Now those are some of my thoughts. I have tried to present them so you could get your teeth into them and have them help you in your planning as you meet problems of tuberculosis. Perhaps I would like to go on further and say we have had at Biggs a fair number of your patients, of your students from foreign lands. The law and regulations of the Public Health Service and the Immigration Service are quite loose in respect to tuberculosis. Attempts are being made to change them. I don't know whether it will be for the better or not. When people come to this country,

sometimes it is a little surprising to find out that they are cleared, or claim to be, by the Public Health Service and by the Immigration Service, and yet soon after arrival in this country we find they have active tuberculosis. They come to this country ostensibly to attend Cornell or some other equally good reason; they don't come ostensibly to be cured of tuberculosis. I think I would like to suggest that you give consideration to very careful checking of all students from foreign lands where tuberculosis is a much bigger problem than it is in this country. Whether they are undergraduates or graduate students, I think for the good of your own student body as well as for the good of the individual coming they should be very very carefully checked. Is there anything you would add, Dr. Toll?"

Dr. Toll: "That's about all, unless Dr. Showacre wants a more detailed description of what Dr. Medlar has found which makes this type of spread of tuberculous lesions possible. When you get or even if you don't get positive bacteriology, if you go back over the years and look at the x-rays, every once in a while you will see little lesions coming and going; and, presumably as Dr. Lincoln pointed out, these are due to small inflammatory areas that don't ever go on to caseation. They are due perhaps to escape of bacterial material from the caseous lesion. I would like to emphasize a little more what you said about considering all aspects of the individual in treating him. Inasmuch as we don't know what is responsible for relapse, all we can say is that something happened to the lesion of the individual in his environment. Something resulted in a disturbance of his normal biological adaptive process, and therefore you have nothing else to do but to regard that relationship as unsatisfactory. It would seem best to take him out of his present environment or to change it in some way to enable him to make a better biological adaptation. Perhaps a simpler way of putting it is to say that one of the basic reasons for hospitalization or home care under satisfactory conditions is to avoid the activity and work in the same environment in which the patient's difficulties have developed."

Dr. Moore: "Is there any way of measuring the antibody titre? Has any work been done to measure immunity in tuberculosis?"

Dr. Lincoln: "There has been a lot of work done on complement

fixation. Dr. Wadsworth, former head of the Division of Laboratories and Research in New York State, tried over a period of years to develop a complement fixation test for tuberculosis. We submitted blood samples, histories, and other clinical data, but he never came up with anything."

Dr. Moore: "Has any study been done on the various plasma protein fractions to see whether some of these people have a lower gamma globulin than others that might make them more susceptible? From what we know about antibody studies I should think that might be a good lead."

Dr. Toll: "Taking the antibody part first, Dr. Moore, the demonstration of circulating antibodies is extremely difficult and is the point of considerable research at the present time. There is a good article in the March issue of the *American Journal of Medicine* by Sherwood Lawrence from Bellevue, who reviews the whole status of what we know about circulating antibodies. I don't necessarily agree with all of what he has to say, but it is an excellent review of the whole thing. One of the interesting things about it is that the tuberculin test has always been a thing that we have used to evaluate whether or not a person has tuberculosis and also to evaluate whether BCG vaccine was effective. There is a difference between a positive tuberculin test and an immunity to tuberculosis and this is most disturbing. The allergic reaction which causes the positive tuberculin test and any immunity which is present in the body should be demonstrable by some form of circulating antibodies which have never been identified in tuberculosis.

"As for the separation of plasma proteins, some studies have been done. The results have been scattered, and thus far they indicate nothing worth while. The American Trudeau Society is sponsoring several studies to further evaluate this point. Peculiarly enough, nobody has yet described tuberculosis in a patient with agammaglobulinemia, which would seem to be the obvious type of patient to get tuberculosis, since they are susceptible to other infections. This problem of immunity in tuberculosis is now being investigated all over again, and it is a most difficult one because no one consistently is able to find circulating antibodies."

Dr. Moore: "At the recent meetings of the American College

of Physicians in Los Angeles there was a great deal of discussion about circulating antibodies and their relation to disease and to tissue transplants. In cases of agammaglobulinemia a tissue transplant will last three times as long as in the person with normal gamma globulin. In other words, these patients build few if any antibodies against foreign tissue, and so the tissue transplant grows and survives much longer. It would seem to me that somewhere in this area there is going to be the answer to the varying degrees of immunity to tuberculosis. Perhaps in the posterior segment the infection gets walled off so that there isn't much stimulation of antibody formation."

Dr. Toll: "There are all sorts of possibilities. Another thing that has been pointed out in relation to what happens locally and generally is the relationship of immunity to the particular type of inflammatory response, whether it is neuterophilic, eosinophilic, or lymphocytic. It has recently been found that one can transfer a positive tuberculin test even in humans by transfusing leukocytes from a patient in the particular phase of development of the tuberculous lesion. This is something that had never been done before and was observed while looking for the effect of the various types of cellular response on local tissue immunity."

Dr. Moore: "What's the chance of this case not being tuberculosis, but being histoplasmosis?"

Dr. Lincoln: "I would think very remote. He had a positive tuberculin test."

Dr. Darsie: "This boy had a positive tuberculin so we didn't do the histoplasmin test."

Dr. Moore: "Is there any reason why the immunity is different in different colored races? Has that been worked out, because that is quite true of histoplasmosis too."

Dr. Lincoln: "I don't think it has been worked out. There isn't any satisfactory explanation for it unless it is a total substance from heredity. You may have seen references to two illustrations of what are regarded as inherited differences in susceptibility to tuberculosis. One is the group of Eskimos that came down to live at the Chicago World's Fair and was practically wiped out by acute pulmonary tuberculosis, the other extreme

is the Jewish people who tolerate more tuberculosis better than any other group that we know. Some people try to relate this resistance to their generations in ghettos in Europe and consider it an uncontrolled experiment in selective breeding. Morphologically I don't think there is any difference as far as the Negro is concerned. I think we do see this difference—the disease tends to be a little more acute, and when the diseased tissue sloughs it tends to slough more cleanly—so when a Negro does well with his tuberculosis he really does grand. I have no explanation as to why this may be."

Dr. Moore: "I think we have a lot to learn about immunity. How would you handle this case if he had a positive sputum now?"

Dr. Lincoln: "I think his sputum is positive as far as he is concerned, and as we are concerned."

Dr. Moore: "In other words, you wouldn't want him to go on in college."

Dr. Lincoln: "I wouldn't. I would put him in the hospital for a period of not less than four months, preferably six, until he got stabilized, and then I would let him gradually become ambulant."

Dr. Moore: "We also have another student with tuberculosis with sputum positive only on culture, and I understand that you think it is all right for him to go on to school."

Dr. Darsie: "No, Dr. Lincoln advised him to be hospitalized and to have surgery. His local physician believes that he can continue safely in school and said that the doctors at Biggs Hospital agreed with him that this patient is not a danger to other students."

Dr. Lincoln: "I agree with that, if repeated sputum examinations show that he is negative most of the time. I personally believe—and quite a good many people feel the same way—that a positive gastric culture only is of academic but no practical hazard to public health; if a person coughs and raises sputum and there is a positive culture only, there is a minimum hazard to those associating with him; if there is any greater positivity, there is a very real danger."

Dr. Moore: "Now suppose this boy won't co-operate; he won't give us a sputum specimen. What should be our reaction? I am

trying to look for a reasonable administrative decision. If this student will co-operate so that we can meet these qualifications that you lay down concerning the degree of sputum positivity, if we have adequate information, then, I think, from the administrative point of view we could go along with his continuing in classes. But if he refuses to give us this information, then I think there is only one thing to do and that is to bar him from school. If we do not, how are we going to protect other people in his immediate environment?"

Dr. Lincoln: "Yes, that I think is the crux of the matter. You have to know what you are dealing with. If you don't have a positive sputum then you don't have a leg to stand on if you order him out of college, and if you haven't negative studies you can't be sure he is not a public health hazard."

Dr. Alexander: "If he refused to co-operate wouldn't it be possible to invoke suspension until such time as he provided sufficient evidence that he was not a public health hazard?"

Dr. Lincoln: "I would think that would make sense. I think it depends on how far you want to go in carrying out the wishes of the attending physician, be he a general practitioner, a tuberculosis specialist, or what have you. That's one side of it. I think you should have full information before making a decision. You may have to compromise occasionally, but under no circumstances do I think you should compromise where there is any reasonable probability of infecting others. If I happened to have a son in class next to this fellow and he contracted tuberculosis and we couldn't find any other source, I would not feel very kindly toward Cornell for letting him be there."

Dr. Moore: "When we first suggested that this student leave school, we got a strong reaction from his family doctor and his so-called tuberculosis consultant. I don't think they were reacting to the facts of the case, but were reacting to the emotions of the family. From my point of view this doesn't make sense."

Dr. Lincoln: "I agree thoroughly that you can't meet a problem as serious as tuberculosis on the basis of emotional reaction."

Dr. Moore: "Yes, I can understand too these students' intense desire to get their education, and there is no time in life when it is so easy to deny illness as when one is a 'teenager.' "

Dr. Rachun: "When a person is put on chemotherapy it ought to be pretty readily determined whether that person reverts to a negative sputum. Is there enough information so that we know that chemotherapy will change a sputum from positive to negative? It seems as if there should have been enough cases studied to provide the answer."

Dr. Lincoln: "There are many reports, but to me, they are all misleading. They report so many patients treated and so many patients attained negative sputum. If you ask what is meant by negative sputum, the reply is, "He hasn't any. He doesn't cough and doesn't raise any sputum." If I wanted to stay out of a hospital and on my feet I wouldn't produce sputum either. You'd be surprised how many patients have this attitude. They think it is wonderful if they can fool us. If patients do fool their doctors they are fooling themselves even more. That is one lesson they must learn."

A Case of Recurrent Spontaneous Pneumothorax

Dr. Haringa: "This is the case of a thirty-one-year-old man whose past history reveals no serious illness. He had malaria in 1945 while in the army. He also had a spontaneous pneumothorax treated at the Johns Hopkins Hospital in 1953. He had tests at that time and was told there was no evidence of tuberculosis. Otherwise he has been in good health. He was first seen in the Infirmary on the evening of December 4, 1955, for a pain in the chest which came on while he was sitting in the theater. He came to the Cornell Infirmary and was seen by the resident, who on the basis of physical signs and history suspected a spontaneous pneumothorax. This was confirmed by x-ray. He was treated on bed rest for a few days, then allowed up in varying degrees, and was discharged on December 10 to convalesce further at home. He got over this uneventfully. I saw him a few times at the Clinic and did tuberculin tests. These were negative in both first and second strengths. He was seen a few times for

upper respiratory infections in the latter part of December and in January.

"Then in February he had another characteristic bout of pain in his chest, which he thought to be a pneumothorax. He called me on the phone at my home, and inasmuch as he had already had the symptoms for several hours, I told him to rest at home, providing there was no increase in his discomfort, and to see me at the Clinic. The signs again were characteristic with hyperresonance and diminished breath sounds on the affected side, which was always the right. X-ray again confirmed the presence of a pneumothorax with about 50-per-cent collapse. He was again treated at home with rest and got over this uneventfully. An x-ray a week later showed that the lung had re-expanded.

"He was next seen by Dr. Darsie shortly after the spring vacation, when he came in for a parking permit because he had had another episode of characteristic chest pain during the spring vacation. He had rested a week, was feeling better, and after the vacation was able to continue his work.

"Then on May 14 he came to the Clinic giving a history of right chest pain of two days' duration. He had remained quiet at home. He was feeling better, but was concerned about the persistence of a fair amount of chest discomfort at times with some shortness of breath on exertion. He again had the usual physical signs on the right side, and this time an x-ray showed 75-per-cent collapse of the right lung. We had previously discussed what the treatment might be in case he should have recurrences, so the patient had given the matter considerable thought. Now we felt that since he had had four episodes since December it was time to do something about it.

"Dr. Showacre took the films over to Dr. Douglass, who also felt it was time to treat this more actively. He recommended that the patient come in for treatment with 50-per-cent glucose instilled into the pleural cavity, and after some discussion the patient accepted this. He came into the Infirmary on May 16, four days after the onset. Dr. Douglass saw him that same morning and by trochar inserted a catheter into the pleural cavity through the right first interspace. He then instilled 40 cc. of 50-per-cent glucose and attached apparatus applying suction of

20 cm. of water. The lung inflated very nicely, and x-ray the next day showed complete expansion. The patient didn't have a great deal of discomfort, although Dr. Douglass predicted that a temperature of about 101° could be expected for a day or two afterward. The patient did have temperatures of 101.4 and 100.8 respectively for two days, but after this it was normal. The catheter was removed after x-rays showed that the lung remained re-expanded for a trial period of twenty-four hours, during which the catheter was clamped off and suction discontinued. After this he got along well and was discharged five days after admission. A follow-up x-ray on May 25 showed that the lung was still re-expanded and normal. Dr. Showacre will now discuss the x-ray findings."

Dr. Showacre: "During the previous episodes of pneumothorax he had two films, one taken with inhalation and one with exhalation. As you know the exhalation film always shows the maximum amount of lung collapse. There is almost total collapse on exhalation and probably about 40-per-cent collapse on the inhalation film, and there is also some mediastinal shift. All subsequent films will be in comparison to this exhalation film since we are interested in the maximum rather than the minimum. This film was taken Wednesday afternoon. Dr. Douglass about ten o'clock in the morning had inserted the tube and instituted suction. You can see now that the lung is fully expanded. I think you can also see the outline of the catheter. He would like to have the catheter tip at the apex of the lung. Sometimes it gets over a little too far so that the catheter starts curling down, but he tries to get it right at the apex. The catheter is introduced through the first interspace. From the skin to the tip of the catheter is about five inches, much farther than you would think. After forty-eight hours we decided to stop suction, so he disconnected the suction apparatus, clamped off the tube, and allowed the boy to go twenty-four hours without suction to see if the lung would go down when negative pressure was no longer maintained.

"This film was taken at that time to show that the lung was still fully expanded even though there had been no suction for twenty-four hours. The next step was to remove the tube, and

here is the second x-ray showing the lung 48 hours later without the tube. The lung still is fully expanded. There is a small amount of fluid, probably in the extreme apex. On May 25 he came in for another film, and if I didn't know the history I would read that film as being absolutely normal. No pathology is seen in the expanded lung.

"Dr. Douglass thinks it is a matter of judgment as to whether you remove air or not. If from the degree of collapse in exhalation one judges that re-expansion of the lung is going to take longer than a week or ten days it would be advisable to take out some air. If you think it will re-expand within ten days or less there is no need to take out any air. If there have been repeated collapses, he would advocate initially the introduction of 50-percent glucose. He uses glucose because it gives a minimum of reaction and is completely absorbed, leaving no foreign material in the pleural cavity. If this fails, then he would recommend further surgical procedure. So far he hasn't had any failures, unless this boy breaks the string of successfully treated cases. However, a failure is apt to come along."

Dr. Wightman: "What is the glucose supposed to do?"

Dr. Showacre: "It irritates the pleura, causing a pleuritis. This will help to seal over the little opening in the visceral pleura and also cause the visceral pleura to adhere to the parietal pleura. If at a later date you wished to do an artificial pneumothorax on this boy you would have some difficulty because of the adhesions between the parietal and the visceral pleura."

Dr. Wightman: "Dr. Black will discuss the causes of pneumothorax."

Dr. Black: "There is nothing very recent in the literature about etiology. The last article of any importance was in 1948 and was a general review of spontaneous pneumothorax. I think it must be many years now since anyone firmly believed that most cases of pneumothorax were tuberculous in origin. Certainly it is over twenty years since this theory was debunked. Since that time various theories have been put forward to explain the condition; some of them have the backing of post-mortem evidence while others are still unproved. Spontaneous rupture of subpleural blebs or bulli is now believed to be the

commonest cause of spontaneous pneumothorax. How these blebs arise in the first place is still a matter of conjecture. One possibility is that they at first may be emphyseal tissue in the lung. This can occur through rupture of an alveolus or bronchiole as a consequence of minimal or of no effort when the patient is walking, standing or even lying in bed. The air may then travel along the connective tissue to the pleural surface and thus form a bleb. Another possibility is suggested by the fact that the most frequent finding of blebs is at the apex and along the upper anterior margin of the lungs. It is postulated that in this region the supports for preventing overexpansion of the lungs are more rigid and that repeated strain such as coughing may strain the elastic tissue in this region giving rise eventually to emphysematous blebs or bulli so that the elastic tissue is eventually broken. However the blebs may happen to be formed, the reason for them to burst is another problem requiring explanation. The explanation usually given is that there is a check valve acting between the bleb and the alveolus to which it is connected. Material forming the valve may be exudate or scar tissue. During respiration air may enter the bleb and be unable to escape from it. Pressure in the bleb gradually increases until it bursts into the pleural cavity. These explanations seem to fit the bill very well, and in some post-mortem examinations blebs with demonstrable rupture can be found. More frequently the blebs can be seen, but the rupture is not discoverable even when water or air is forced through the lungs. In a further group of cases the lungs are apparently fully normal. A possible cause of the pneumothorax in these cases was put forward by Hammond in 1939, who based his ideas on some work done by Machlin. The latter showed that in animal experiments when he increased the intrapulmonary pressure, air escaped from small ruptures in aveolar and bronichiolar walls. This air traversed the vascular sheaths to the root of the lung. There it pierced the mediastinum and produced spontaneous mediastinal emphysema, or it might extend to the pleura to form a bleb as I mentioned above. Air which has reached the mediastinum may rupture through the inner mediastinal wall, and this is what happened in the experiment with animals. In humans there is some circumstantial evidence supporting this theory.

There is also the clinical evidence that in a certain number of cases known to have a mediastinal emphysema there is also spontaneous pneumothorax. Two patients out of four in one series that had mediastinal emphysema had spontaneous pneumothorax and two out of seven in another series. There are one or two other uncommon causes of a spontaneous pneumothorax; one is rupture of a congenital cyst of the lung and the second is rupture of bulli in true emphysema. It is pointed out that most patients with pneumothorax do not have true emphysema. Lastly there is tuberculosis. At one time pneumothorax was found in 10 per cent of autopsies of tuberculosis patients. The highest incidence was in actively progressing lesions in which the subpleural cavity or caseous focus overlying adhesions had eroded into the pleural cavity. Also tearing of adhesions at the base of necrotic lesions initiated pneumothorax. It is pointed out that if a tuberculous focus ruptures into the pleural cavity there is a marked constitutional reaction, but this is not seen in spontaneous pneumothorax. It is also clear that spontaneous pneumothorax patients rarely develop tuberculosis in later years. In a series of 250 patients with pneumothorax who were studied over a long period of years only six developed tuberculosis. Hammond believes that when pneumothorax occurs in proven tuberculosis patients, the mechanism is exactly the same as in nontuberculosis patients."

Dr. Wightman: "Is there any predominant age incidence?"

Dr. Haringa: "I read of one series in which the range was fifteen to sixty-four years and nearly half of the group were in the age group of twenty to twenty-four years."

Dr. Showacre: "Marginal or minimal spontaneous pneumothorax is quite common at Cornell. Complete collapse is rather unusual and recurrence is rare, and so we do not have many cases in which the air should be removed and very few indeed in which glucose should be introduced. The vast majority of cases can be treated simply by rest with the expectation that the lung will be re-expanded in approximately one week. Dr. Douglass' belief is that all of these cases should be back in class in about a week or ten days and that if the period of time as you

judge it initially is going well beyond that then something should be done other than just simple rest.

"Materials other than glucose may be used intrapleurally. Some of the patient's own blood or lipiodol may be used. There are various powders that have been used to irritate the pleura, but they often leave a foreign residue which is objectionable. As a last resort, if such measures fail, there is surgical intervention. The chest is opened and the ruptured bleb found and sutured."

Dr. Wightman: "Is it difficult to locate the area of rupture?"

Dr. Showacre: "It is difficult by x-ray unless the rupture happens to be right out on the periphery and one can see the bleb; that one does not commonly do. After it is ruptured the bleb usually is collapsed. I have wondered myself how much trouble the surgeon has finding it when he opens the chest. I didn't ask Dr. Douglass about that."

Dr. Haringa: "Some advocate looking in with a thoracoscope inserted via a trochar to locate the offending blebs. For small blebs they use talc insufflation and report excellent results. In a few cases large blebs are found and these are resected."

Dr. Moore: "One thing hasn't been brought up and that is the ball valve effect which builds up pressure sometimes to the point where the patient has to be decompressed. I have been amazed at the lack of indications for decompression that has occurred in this hospital. The first two cases I saw as a Bellevue intern were nurses and both of them had to be decompressed. I never remember one case here that had to be decompressed, and yet we were continually watching for tension pneumothorax."

Addendum: On June 7, 1956, the patient experienced another recurrence of right chest pain coincident with a sneeze. A chest x-ray showed about 35-per-cent collapse of the right lower lobes and of the lower two-thirds of the right upper lobe. The right upper lobe appeared to be adherent to the chest wall from the apex to the first anterior intercostal space. He was hospitalized until June 11, 1956, when an x-ray showed slight re-expansion. Since the summer vacation was imminent, the patient chose to consult a thoracic surgeon near his home. No further procedures had been performed when he was last heard from on July 4, 1956.